TOOELE ARMY DEPOT
Tooele, Utah

DRAFT
PHASE II RCRA FACILITY INVESTIGATION
WORK PLAN for SUB SLAB SOIL GAS SAMPLING - BUILDING 615

Contract Number: GS-10F-0179J

US Army Corps of Engineers®

Submitted to:
U.S. Army Corps of Engineers
Sacramento District

March 2006

PARSONS

Prepared by:
PARSONS
Salt Lake City, Utah

TOOELE ARMY DEPOT

Tooele, Utah

DRAFT
PHASE II RCRA FACILITY INVESTIGATION
WORK PLAN for SUB SLAB SOIL GAS SAMPLING - BUILDING 615

Contract Number: GS-10F-0179J

Submitted to:

U.S. Army Corps of Engineers

Sacramento District

March 2006

Prepared by:

PARSONS

Salt Lake City, Utah

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

ASG	Active Shallow Soil Gas
COC	Chain of Custody
DQO	Data Quality Objective
ID	Inner Diameter
mL	Milliliter
OD	Outer Diameter
PTFE	Polytetrafluoroethylene
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
SWMU	Solid Waste Management Unit
TEAD	Tooele Army Depot
TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VMP	Vapor Monitoring Point
VOC	Volatile Organic Compound
VPB	Vertical Profile Boring
VSG	Vertical Soil Gas

SECTION 1.0

INTRODUCTION

SECTION 1.0

INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

Pursuant to the Tooele Army Depot (TEAD) Final Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation SWMU-58 Work Plan (Parsons, 2003), shallow and deep soil-gas investigations have been conducted within and peripheral to the former TEAD industrial area. Deep soil-gas investigations are ongoing, along with other site characterization activities. The present state of the investigations and results to date are presented in the Final Phase II RCRA Facility Investigation SWMU-58 Work Plan Sampling and Analysis Plan (SAP) Addendum 1 (Parsons, 2004) and the Draft Phase II RCRA Facility Investigation SWMU-58 Work Plan SAP Addendum 2 (Parsons 2006). A primary goal of these area-wide soil-gas investigations is to locate the source areas of the chlorinated solvent releases, at least some of which are impacting the regional unconfined aquifer.

Based on results to date, it has been determined that Building 615 is a significant source of chlorinated solvent contamination that has migrated to groundwater. However, specific release points and mechanisms at this site remain largely unknown or poorly understood. One intent of this investigation is to identify, if possible, specific areas beneath the building slab that might be indicative of one or more release points to the vadose zone.

Building 615 is in active use as a metal fabrication shop and auto body repair shop, including painting facilities. Consistent with the goals of Final Phase II RCRA Facility Investigation SWMU-58 Work Plan (Parsons, 2003), further characterization is necessary to determine if a source area is present within the building footprint, and to determine if there are potentially unacceptable risks to building workers from the vapor intrusion pathway. This document is a Work Plan intended to describe the initial steps of the process of characterizing sub-surface contamination within the footprint of Building 615 via sub-slab soil-gas sampling.

Depending on the outcome of this investigation, follow-up investigations may be necessary. Objectives of any future studies may include: 1) identification of any current chlorinated solvent inventories and their use in metal preparation and painting operations within the building; 2) determination of the impact of current occupational use on the sub-slab concentrations of solvents; 3) evaluation of sub-slab engineering features as a) preferential pathways for vapor or product transport; and b) potential sources of release; 4) assessment of the Building 615 indoor air, and/or 5) evaluation of the spatial distribution of solvent contamination within the deeper vadose zone directly beneath the Building 615 footprint.

1.2 WORK PLAN ORGANIZATION

This Work Plan is divided into five sections and one appendix described below:

Section 1.0 Introduction
Section 2.0 Building Setting and History
Section 3.0 Prior Investigation Results
Section 4.0 Recommendations
Section 5.0 References

Appendix A Standard Operating Procedure (SOP) for Sub-Slab Soil-Gas Sampling and Analysis.

SECTION 2.0

BUILDING SETTING AND HISTORY

SECTION 2.0

BUILDING SETTING AND HISTORY

Building 615 is an "L" shaped structure (Figure 2.1) built in 1956. Building 615 has been used as a metal processing facility, and later for vehicle component rebuilding, sandblasting, and painting (TetraTech, 1996). Known past processes generating hazardous waste included metal stripping, cleaning, anodizing, and vapor degreasing (using trichloroethene [TCE] and 1,1,1-trichloroethane [TCA]).

Plan drawings dated February 1979 and interview notes (*Notes from meeting on February 17, 2005 with Butch Johnson and Richard Wheeler)* indicate that degreasing took place along the west wall of the structure, in the location noted on Figure 2.1.

Solvent and parts cleaning baths were located along the eastern side of the west wing, and wrapped around the corner into the north wing. A paint and adjoining drying booth were constructed at the east end of the north wing.

The building contains several underground drainage features which are poorly understood. A trough in the concrete that paralleled the southwest and east walls of the west wing, and also ran parallel to a section of the southeast wall of the north wing, conveyed solvent and other chemical waste from the parts cleaning line. The waste was discharged into the sanitary sewer system via several floor drains. Regrettably, no detailed TEAD building plans have been found that show the effluent lines within Building 615, and the exit points for these lines. However, larger scale drawings that show the industrial piping wastewater lines for the entire former TEAD industrial area indicate that effluent lines exited the building 1) near the intersection of the southeast and east walls of the north wing, 2) along the north wall of the north wing adjacent to the paint booth, and 3) about midway along the southwest wall of the west wing (Parsons, 2003; Figure 4.4). A detailed discussion of the known history of building 615, including additional information regarding conveyance of industrial effluent and stormwater from the building and immediate environs is included in the Final Phase II RCRA Facility Investigation SWMU-58 Work Plan (Parsons, 2003). However, little of it is germane to this investigation.

During a recent examination of the paint booth within the north wing, two parallel grated trenches an estimated four to five feet deep and three feet wide were observed extending almost the entire length of the booth. The two trenches are considered part of an air removal system designed to keep atmospheric VOC concentrations within the paint booth at acceptable levels. The mechanics of the system are still poorly understood. Nevertheless, there are no indications that chlorinated solvents were used in the painting process, and no reason to believe that elevated concentrations of solvent compounds might be present within the grated trenches.

Solvent waste storage was originally outdoors on unpaved ground adjacent to the northern part the west side of the building, and extends to the northeast as far as Building 627. Later solvent storage was moved into satellitic buildings 615C and 615D, which were built for that purpose (*Notes from meeting on February 17, 2005 with Butch Johnson and Richard Wheeler).* Storage of paint occurred in a small one room addition to the north side of the building adjacent to the north wing paint booth. There is no evidence that chlorinated solvents were stored at the same location.

At least one significant solvent release is known to have occurred when a 1000 gallon fiberglass tank failed and TCE overtopped the one-foot high containment berm. This container was located in the west wing. TCE flowed out bay doors to the stormwater a manhole located at the southwest corner of the property (*Notes from meeting on February 17, 2005 with Butch Johnson and Richard Wheeler)*.

It is presumed that solvent supplies may have been handled between the rail line that ran along the west side of Jake Court and Building 615.

SWMU 58
PHASE II RFI
TOOELE ARMY DEPOT
TOOELE, UTAH

0 40
Feet

LEGEND

FIGURE 2.1

BUILDING 615
DETAIL

w:\tooele\maps\bldg_615_subslab_wkplan\fig2_1_bldg_detail.mxd 3/16/06

PARSONS

SECTION 3.0

PRIOR INVESTIGATION RESULTS

SECTION 3.0

PRIOR INVESTIGATION RESULTS

In Phase I of the RCRA Facility Investigation passive soil-gas samples were collected, and a vertical soil-gas (VSG) well was installed (I610-VSG004). Passive soil-gas sample results are not considered in planning this work because:

- Coverage around building 615 is incomplete
- Samples were taken mainly in or near streets, and are not as close to the building as Phase II samples
- Sample results are expressed in units of mass, not concentration
- Sampling was intended as a broad area investigation
- Phase II results that are now available are much more detailed with respect to building 615.

In Phase II of the RCRA Facility Investigation, to date, active shallow soil-gas (ASG) samples were collected at approximately 7 feet below ground surface (ft bgs) surrounding building 615 as shown on Figure 3.1. TCE was found to be the primary contaminant. The highest results (results are shown Figure 3.1) were observed along the west wall, near the location of the former degreaser, along the north wall in the vicinity of the paint booth, and along the east wall. Concentrations of TCE were highest along the east wall.

Vertical profile borings (VPBs) were advanced as shown on Figure 3.1. Additionally, VPBs were converted to VSGs wells as shown on Figure 3.1. In combination with the existing VSG (I610-VSG004), this provides deep soil-gas coverage at all of the ASG highs, and additionally along the southeast wall. The spatial distribution of TCE at the two shallowest depths in the VPBs was generally consistent with the ASG results in the sense that the highest values were noted along the east wall, the second highest along the north wall, the third highest along the west wall, and the lowest concentrations were observed along the south east wall. Detailed results are not reproduced here as ASGs are considered more predictive of sub-slab conditions than the deeper VPB results.

VSGs were sampled but did not correspond well with ASGs and VPBs. Two further rounds of VSG sampling are planned for 2006, and results will be available for use with the results of the sub-slab samples proposed herein. Detailed VPB and VSG results are provided in the Draft Phase II RCRA Facility Investigation SWMU-58 Work Plan SAP Plan Addendum 2 (Parsons, 2006).

SWMU 58
PHASE II RFI
TOOELE ARMY DEPOT
TOOELE, UTAH

0 40 Feet

LEGEND

PHASE I RFI

- Vertical Soil Gas Well

PHASE II RFI

- Primary Shallow Active Soil Gas Point
- Follow Up Shallow Active Soil Gas Point
- Vertical Profile Boring
- Vertical Profile Boring Converted to Vertical Soil Gas Well

Notes:

DCE11 = 1,1-DCE
DCE12C = CIS-1,2-DCE

I610-ASG027 and I610-ASG028 are actually located outside of building. They appear to be within building due to aerial photgraphy distortion.

FIGURE 3.1
ACTIVE SOIL GAS, VERTICAL PROFILE BORING, AND VERTICAL SOIL GAS WELL LOCATIONS IN THE VICINITY OF BUILDING 615

w:\tooele\maps\bldg_615_subslab_wkplan\Fig_3_1_VPB_VSG_615.mxd 3/13/2006

PARSONS

SECTION 4.0

RECOMMENDATIONS

SECTION 4.0

RECOMMENDATIONS

Recommendations will be developed using the data quality objective (DQO) process.

4.1 DATA QUALITY OBJECTIVES

The DQO process provides a systematic planning tool to establish criteria for quality field data collection and derivation of a consistent data collection design for this field program. The DQO process consists of seven steps, the output of each step affecting subsequent steps. This approach is based on the following United States Environmental Protection Agency (USEPA) documents:

- Guidance for the Data Quality Objectives Process (USEPA, 2000)
- Data Quality Objectives Process for Superfund (USEPA, 1993)

The seven steps identified below were developed for this field program according to the most resource-effective approach.

4.2 STATE THE PROBLEM

Building 615 is associated with a history of solvent use. The building has poorly understood underground features and former features (drains, sumps, or other engineering features) which may be related to releases. Solvent contaminated media (soil, soil-gas, groundwater) have been identified surrounding the building. As a first step to determine if a source area underlies the building, information on sub-slab concentrations of soil-gas are required. In Appendix D of the Final SWMU-58 Supplemental Risk Assessment from Exposure to Volatile Organic Compounds in Shallow Subsurface Soils (Parsons, 2005b), preliminary modeling of the ASG data indicated that depending on the choice of assumptions and threshold values chosen, that the vapor intrusion pathway was potentially complete. Therefore sub-slab soil-gas data is also necessary to determine if contaminated media potentially pose a threat to building workers via the vapor intrusion pathway.

4.3 IDENTIFY THE DECISIONS

The results of analytical sampling evaluation will be used to determine: 1) if a potential source area of solvent contamination exists beneath the building footprint; 2) if additional characterization activities are warranted; 3) whether a potential threat to building 615 workers exists from contaminated media by the vapor intrusion pathway; and 4) whether further investigation of the vapor intrusion pathway is warranted. It is noted that if future investigation is warranted, it will be necessary to determine the potential impact to sub-slab soil-gas and/or indoor air concentrations from the current industrial use of the building.

4.4 IDENTIFY INPUTS TO DECISIONS

Sub-slab soil-gas samples will be collected. For site characterization, results will be compared to existing ASG and VPB results. Additionally, new VSG sampling results (sampling planned separately) should also be available when this study is complete. Building history and design will also be considered.

Sub-slab soil gas results will be used to evaluate the vapor intrusion pathway—the migration of volatile organic compounds (VOCs) from the subsurface into the indoor air of a building, where they may be inhaled by human receptors and potentially pose unacceptable risks to human health. For assessment of the vapor intrusion pathway, the maximum of the sub-slab sample results will be the initial input. Depending on results, an upper confidence limit (UCL) of the arithmetic mean at the 95% confidence level may be calculated in accordance with the procedures described in Section 3 of the Final SWMU-58 Risk Assumptions Document, Revision 1, (Parsons, 2005a).

4.5 DEFINE THE BOUNDARIES OF THE STUDY

The study is limited to those areas within building 615 which are made accessible by the current tenants.

4.6 DEVELOP DECISION RULES

Quantitative comparison of ASG, VPB and VSG results with sub-slab samples may not be possible due to the temporal displacement of sampling events, differences in sample depth, and the unknown effects of the slab and its underground engineering features in causing vapors to accumulate, ventilate, or disseminate preferentially. However such comparisons will be evaluated. Ultimately, for purposes of site characterization, e.g. identifying a potential source area, results will be evaluated judgmentally considering all available data.

The decision criteria for sub-slab soil gas results will be based on site-specific soil gas screening concentrations calculated using USEPA's 2004 version of Johnson and Ettinger's (Johnson, P.C. and R.A. Ettinger. 1991. Heuristic model for predicting the intrusion rate of contaminant vapors in buildings. Environmental Science and Technology 25: 1445-1452) vapor intrusion model (see Parsons, 2005b, Appendix E for sample vapor intrusion calculations). If site sub-slab soil gas results are below these screening concentrations, the vapor intrusion pathway will be assumed to insignificant. If sub-slab soil-gas concentrations exceed these screening values, additional investigation (e.g. refined modeling and/or indoor air sampling) may be warranted.

4.7 SPECIFY LIMITS ON DECISION ERRORS

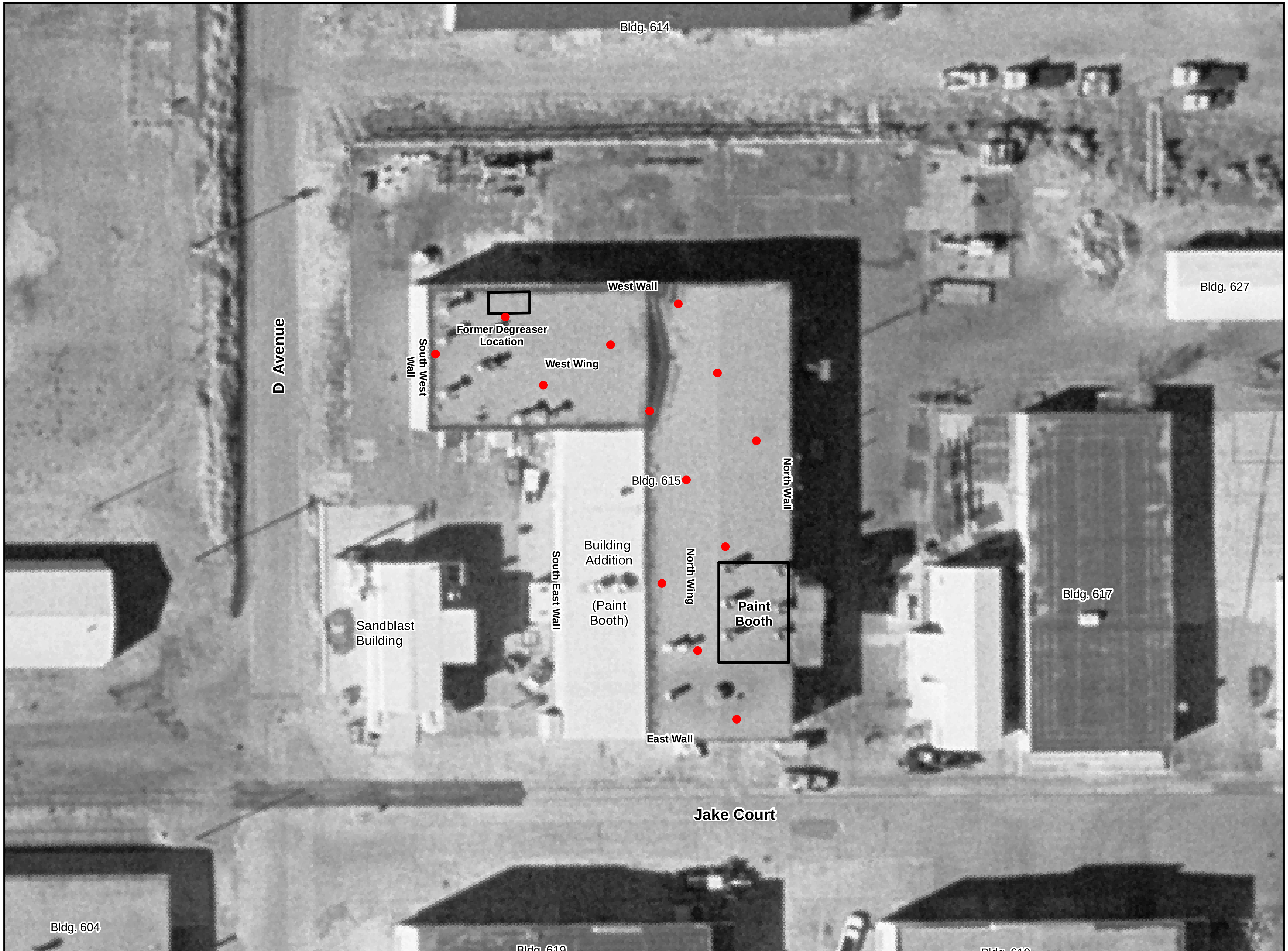
Because the site characterization determination is judgmental, no limit on decision error can be formulated.

For assessment of the vapor intrusion pathway, guidance documents and limits have been developed conservatively. Analytical data will be assumed to adequate if the quality control requirements specified in the attached standard operating procedure (SOP) for sub-slab soil-gas sampling are met. Analytical data typically are expected to be reported within 20% of the actual value present in the soil-gas, and this amount of error is well within the conservative assumptions built into decision rules.

4.8 OPTIMIZE THE SAMPLING DESIGN

To obtain a statistically valid estimate of the average (e.g. 95-percent upper confidence limit) sub-slab soil-gas concentration for assessment of the vapor intrusion pathway, and to ensure representative coverage of the building footprint (throughout area that the tenant has agreed to make accessible), a grid design with 13 evenly spaced sampling points has been chosen. Although some parts of the building are not accessible due to tenant restrictions and subsurface engineering systems, those areas most closely associated with high ASG results have all been included. Therefore the design as presented (Figure 4.1), is somewhat conservative in its representation of the building footprint because some areas associated with lower ASG results are not included.

Sampling will be accomplished at the points presented in Figure 4.1. Sample collection procedures, analysis, and quality control are defined in Appendix A.



SWMU 58
PHASE II RFI
TOOELE ARMY DEPOT
TOOELE, UTAH

0 40
Feet

LEGEND

Sub-Slab Vapor Monitoring Points

FIGURE 4.1

SUB-SLAB
VAPOR MONITORING
POINT LOCATIONS
BULDING 615

w:\tooele\maps\bldg_615_subslab_wkplan\fig4_1_monitoring_points.mxd 3/16/06

PARSONS

SECTION 5.0

REFERENCES

SECTION 5.0

REFERENCES

Johnson, P.C. and R.A. Ettinger. 1991. *Heurisitic model for predicting the intrusion rate of contaminant vapors in buildings*. Environmental Science and Technology 25: 1445-1452

Parsons, 2003. *Final Phase II RCRA Facility Investigation*, SWMU-58 Work Plan, Tooele Army Depot, Tooele, Utah: prepared for U.S. Army Corps of Engineers (USACE), Sacramento District.

Parsons, 2004. *Final Phase II RCRA Facility Investigation SWMU-58 Work Plan Sampling and Analysis Plan Addendum #1*, Tooele Army Depot, Tooele, Utah: prepared for the U.S. Army Corps of Engineers (USACE), Sacramento District; September.

Parsons, 2005a. *Final SWMU-58 Risk Assumptions Document, Revision 1*, Tooele Army Depot, Tooele, Utah: prepared for the U.S. Army Corps of Engineers (USACE), Sacramento District; July

Parsons, 2005b. *Final SWMU-58 Supplemental Risk Assessment from Exposure to Volatile Organic Compounds in Shallow Subsurface Soils*, Tooele Army Depot, Tooele, Utah: prepared for the U.S. Army Corps of Engineers (USACE), Sacramento District; November

Parsons, 2006. *Draft Phase II RCRA Facility Investigation SWMU-58 Work Plan Sampling and Analysis Plan Addendum #2*, Tooele Army Depot, Tooele, Utah: prepared for the U.S. Army Corps of Engineers (USACE), Sacramento District; January

Tetra Tech, 1996. *Environmental Baseline Survey*, Tooele Army Depot, BRAC 93 Excess Property Parcel. Tooele Army Depot, Utah.

USEPA, 1993. *Data Quality Objectives for Superfund.* Interim Final Guidance. EPA Reports No. EPA/540/R-93/071.

USEPA, 2000. Guidance for the Data Quality Objectives Process. EPA Reports No. EPA/600/R-96/055.

APPENDIX A

STANDARD OPERATING PROCEDURE (SOP) FOR SUB-SLAB SOIL-GAS SAMPLING AND ANALYSIS

APPENDIX A

SOP FOR SUB-SLAB SOIL VAPOR SAMPLING

This standard operating procedure (SOP) is applicable to installing, testing and sampling vapor monitoring points (VMPs) in buildings constructed on concrete slabs. If any additional floor covering exists, it should be removed prior to beginning work. Additionally, every effort must be made to identify in-slab, or sub-slab features that may interfere with, or be damaged by VMP installation.

1.1 INSTALLATION

A rotary hammer will be used to make a 2 inch diameter hole 2 inches deep into the slab. Then the bit will be changed and a 5/8 inch diameter hole will be extended through the slab, for each VMP. Each hole will be drilled to a total depth of 8 inches below the slab (Figure 1). A 6-inch-long stainless steel Geoprobe® soil gas sampling implant, or equivalent, connected to ¼-inch polytetrafluoroethylene (PTFE) tubing will be used for the VMP. The annulus around the implant will be backfilled with sand pack to the bottom of the cement slab. 2" of granular bentonite will be placed above the sand and hydrated with deionized water to seal the annulus and prevent the grout from infiltrating the sand. A fast setting cement grout will be injected into the remaining tubing annulus (using a syringe for precise placement) above the bentonite seal rising to the location where the boring diameter increases to 2 inches. After the cement cures a thin film of sodium silicate will be applied to the top of the grout. The sampling port of the VMP will be constructed with a threaded Swagelock stainless steel union and threaded cap which will allow for sealed equilibration and connection of the sample tubing. The cement grout will be allowed to cure at least 48 hours prior to leak testing and sampling. This period will also allow sub-slab vapors to re-equilibrate following VMP installation. Installation will be documented photographically, and using a field log book.

1.2 SAMPLE COLLECTION AND ANALYSIS

After the cement grout has cured and immediately prior to collecting the samples; a leak test will be preformed on each VMP to ensure that the grout seal has integrity. If any VMP fails the leak test additional sodium silicate will be applied to the top of the borehole and the VMP retested. If that does not solve the problem the VMP will be re-drilled and construction steps identified in section 1.1 above will be repeated.

Leak testing and sampling are detailed as follows and illustrated in Figure 2**.**

1.2.1 Leak Test

1. A 5 gallon helium chamber will be constructed which will fit over the completed VMP. The sampling train will be in place and connected as shown in Figure 2.
2. Helium gas will be released inside the box from Regulator Valve 1. A helium detector with a minimum rated sensitivity of 0.01% will be used to ensure helium gas is present at minimum concentration of 10% in the helium chamber by connecting detector to the Helium Sampling Port 1. Upon confirmation, Helium Sampling Port 1 will be closed and the helium detector will be connected to Helium Sampling Port 2. The concentration of helium in the chamber shall be recorded in the field log book.
3. The Directional Control Valve 2 will be opened to enable soil vapor to be pumped from the VMP through the sampling tubing and flow controller. There will be a minimum of three purge volumes of vapor extracted from each sampling point during the leak test. Purge volume will be calculated using a 5/8” diameter from the bottom of the slab surface to the bottom of the boring, plus an allowance for the length of PTFE tubing from the bottom of the slab surface to the pump. Assuming an 8” deep boring from the bottom of the slab surface, and using 48” of 0.170” inner diameter (ID) PTFE tubing (assuming 10” within the slab, and 38” attached above the slab surface), the calculation for one purge volume would be as follows:

   (5/8”)/2 = radius, r = 0.3125

   πr^2 = area = $(3.141)(0.3125)^2$ = 0.3068 inches square

   volume = (inches square)(length) = (0.3068)(8) = 2.454 cubic inches

   1 cubic inch = 16.39 mLs

   2.454 cubic inches = 40 mLs

   (0.170”)/2 = radius, r = 0.085”

   πr^2 = area = $(3.141)(0.085”)^2$ = 0.02270 inches square

   volume = (inches square)(length) = (0.02270)(48) = 1.090 cubic inches = 18 mLs

   volume of boring + volume of tubing = one purge volume = 58 mLs

   The volume purged, purge start time, purge stop time, and purge flow rate shall be recorded in the field log book.

4. The extracted gas will be monitored for any measurable detection of helium, which would indicate short-circuiting of the borehole. The helium concentration shall be recorded in the field log book.
5. If helium gas is detected in the extracted gas, additional sodium silicate will be applied to the top of the borehole and the leak test performed again to verify the integrity of the VMP construction. If helium is still detectable in the extracted gas, the VMP will be abandoned.

After the test is completed at each location; sampling will begin as follows:

1.2.2 Sample Collection

1. Samples for laboratory analyses will be collected directly into pre-cleaned, 6-liter, flow-controlled, evacuated SUMMA® canisters. 8 hour flow controllers will be provided by the laboratory. The SUMMA® canisters will be shipped to the field by the analytical laboratory batch certified clean to the specified method detection limit.
2. Prior to sampling, each canister will be checked to verify that the vacuum in the canister is greater than 22 inches of mercury. If the vacuum is less than 22 inches, the SUMMA® canister has lost its integrity due to laboratory error in preparation or leakage and will not be used.
3. The initial vacuum will then be recorded on the chain of custody form, and in the field log book.
4. After leak testing, **Valve 2** will be switched to enable flow connection to the SUMMA® canister and the pump will be shut off. Then the valve on the SUMMA® canister (**Valve 3**) will also be opened counter-clockwise 3 to 4 turns. Air movement should be heard through the flow controller. The time shall be recorded in the field log book.
5. The sample will be collected over an 8-hour interval. After sample collection, the final vacuum of the SUMMA® canister will be recorded on the chain-of-custody form and in the field log book. Then the Summa canister **Valve 3** will be closed and the flow controller, gauge and sample line will be removed. The time shall be recorded in the field log book.
6. The valve cap on the SUMMA® canister will be put back on.
7. The sample canister will be packed with newspaper in rigid containers for shipment to the laboratory. Samples will be sent at ambient temperature to prevent condensation. A chain-of-custody form describing the contents of the

shipment will be filled out and placed in the shipping container. The shipping container will be sealed in a tamper evident manner.

8. The samples will be analyzed using EPA Method TO-15 using direct injection. The analysis is described in section 4.7.1 of the Final Phase II RCRA Facility Investigation SWMU 58 Work Plan.
9. If for any reason a VMP is re-sampled in the future, the helium leak test may be omitted, however a minimum of three purge volumes of sub-slab vapor must be purged prior to collecting the sample.
10. All measurements and field conditions will be recorded in the field log.

1.3 FIELD QUALITY ASSURANCE/QUALITY CONTROL

A number of QA/QC steps will be incorporated into the program to ensure the data collected will meet the objectives of the study. These QA/QC steps supersede the frequencies shown in Table 4.7 of SWMU 58 Work Plan. For the leak test, no helium tracer gas may be detected in the sample. If helium is detected, corrective action will be taken until the sample point is leak free. Acceptance criteria and corrective action for the field duplicate and trip blank will be as specified in Table 4.7.

1. One field duplicate sample will be collected per building per event, for every 10 samples. The field duplicate sample will be a split sample taken from the same vapor flow of its accompanying standard sample through application of a T in the tubing directly below **Valve 2**.
2. One trip blank or unopened SUMMA® canister will be identified per event and returned labeled as a sample for analysis.
3. No ambient blank will be collected.

1.4 EQUIPMENT LIST

Item	**Vendor**
VMPs	
1/4" OD PTFE Tubing (0.170" ID)	Geotech or local source
SS implant screen	Geoprobe
1/4" union	Swagelok
1/4" plug (cap)	Swagelok
Benseal (8-mesh)	Baroid
Quick setting portland cement	local source
Sand	local source
Sodium silicate solution	local source
Syringe	local source
HELIUM LEAK TEST & CHAMBER	
1/4" bulkhead reducer	Swagelok
Helium	local supplier
Regulator for helium tank	local supplier
PTFE tubing	Geotech or local source
5-gallon plastic bucket	local supplier
SAMPLING	
Sampling pump	US Environmental, or equivalent
Helium detector Mark Products Model 9860, or equivalent	US Environmental, or equivalent
Tedlar bags 1-liter	SKC, LSS
3-way valve	Swagelok
Tee	Swagelok
1/4" union	Swagelok
Port connector	Swagelok
Female nut	Swagelok
6L pre-cleaned, evacuated summa	laboratory
8-hour flow controller	laboratory
Pressure guage	laboratory
Gas flow rate gauge (if not included on pump)	local supplier
GENERAL	
Digital Camera	Parsons
Field Log book	Parsons
Tool Kit	Parsons
COC Forms	Parsons

1.5 REFERENCES

DTSC 2003. *Advisory –Active Soil Gas Investigations*, California Department of Toxic Substance Control and California Regional Water Quality Control Board, Los Angelos Region, January 28, 2003.

DTSC 2004. *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, California Department of Toxic Substance Control, December 15, 2004 (revised February 7, 2005).

Geoprobe Systems Undated. *Implants Operation*, Geoprobe Systems available at http://www.geoprobe.com/literature/instruction/Implants%20Oper.pdf, accession date March 20, 2006.

NJDEP 2005. *Draft Vapor Intrusion Guidance*, New Jersey Department of Environmental Protection, June 2005.

USAF 2005. *Final Work Plan for Supplemental Remedial Investigation, Feasibility Study, Proposed Plan, and Record of Decision at Spill Site 01 (SS01) Hickham Air Force Base Hawaii*, United States Air Force, June 2005.

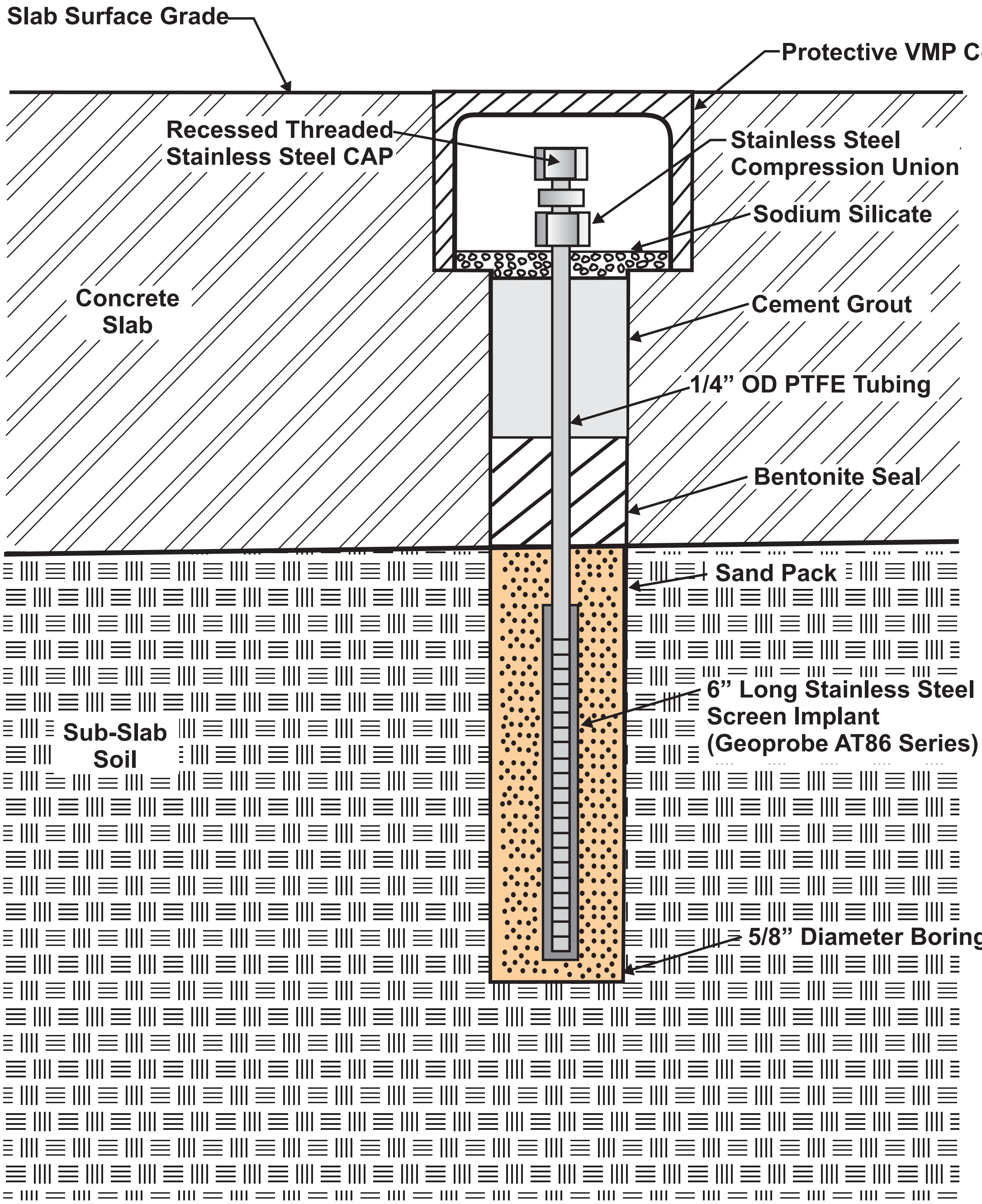
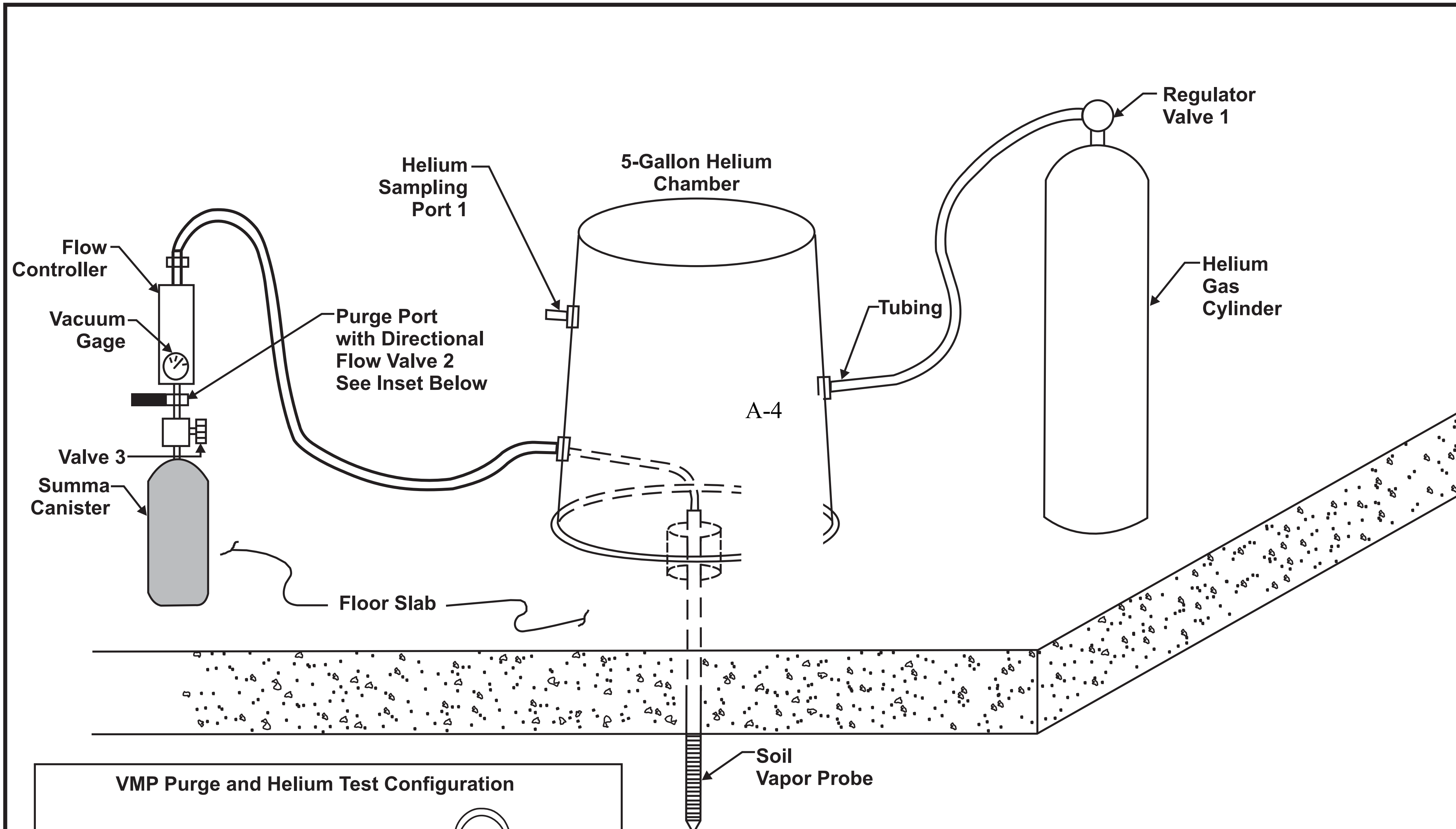


FIGURE 1

SUB-SLAB VAPOR MONITORING POINT DETAIL

Building 615

PARSONS



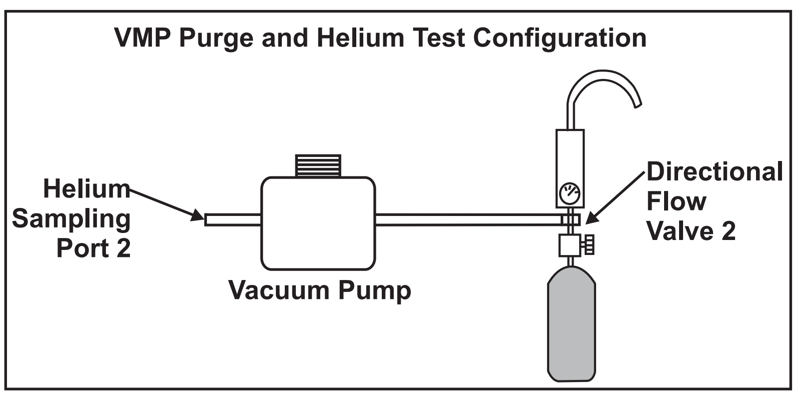


FIGURE 2

SCHEMATIC DIAGRAM OF HELIUM LEAK TEST APPARATUS AND SOIL VAPOR SAMPLING CONFIGURATION

PARSONS

X:\7DUGWAY\740227_Toole_Ind\Parsons Document\Work Plan For BLDG 615 Sub-Slab Sampling